

LHDにおけるストキャスティック磁場構造と水素・不純物発光分布との関係 Relation between hydrogen/impurity emission distributions and stochastic magnetic field structure in LHD

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The 2D distributions of impurity radiation and emission from hydrogen have been measured at the edge stochastic layer, using visible imaging spectrometer, which has been newly installed in LHD. 2D distributions of hydrogen and impurity emission have been measured.

Figure 1(a) shows a viewing area of the 2D visible spectrometer system, where the magnetic field lines and the envelope of the last closed flux surface (LCFS) are shown together with the spatial location of the individual channels. The number of channels is 130, and they cover the divertor plates, divertor legs, stochastic layer, and the confinement region. Fig.1(b) shows the poloidal cross section of the magnetic field line connection length distribution at the horizontally elongated section, where the locations of the divertor plates, divertor legs, X-point of divertor legs, LCFS are indicated, in order to provide correspondence between the field of view of Fig.1(a) and the magnetic field structure.

The detachment stabilization experiment with RMP application has been conducted. The reconstructed 2D image of the ratio H_γ to H_β during the detached phase is plotted in Fig.2, which is an indicator of volume recombination. It is found that the after the detachment transition, the ratio increases along the LCFS, indicating the existence of volume recombination of hydrogen with very low temperature. Clear upstream shift of impurity radiation along divertor legs and towards the X-point has been detected. The measurements indicate formation of dense and cold plasma outside of LCFS during detachment phase. The Doppler shift of carbon emission spectra has been analyzed. It suggests an existence of strong impurity flow along the field lines, $\sim 2 \times 10^4$ m/s. The flow speed is found to increase at high density range. At the conference, the 2D distribution of CII, CIII and CIV will be presented and the detailed detachment transition scenario will be discussed.

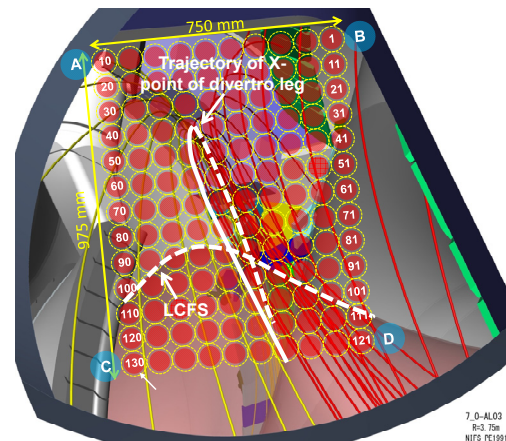


Fig.1 (a): Viewing area of the 2D visible spectrometer system. Magnetic field lines of divertor legs, trajectory of X-point of divertor legs and the envelope of LCFS are shown.

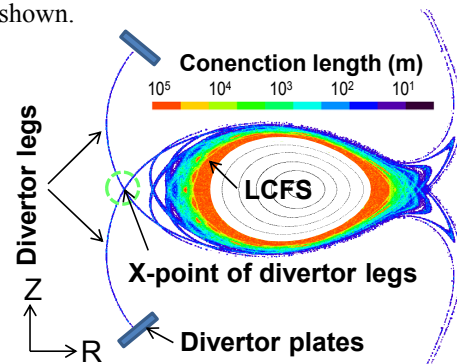


Fig.1 (b): Poloidal cross section of connection length distribution of LHD.

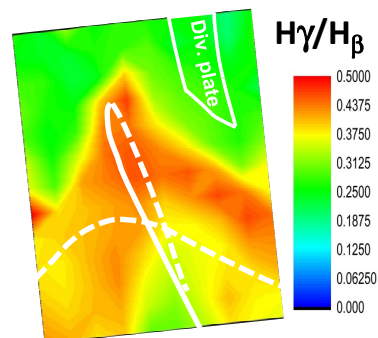


Fig.2: Reconstructed 2D distribution of the ratio H_γ to H_β during detachment phase obtained by the spectrometer.

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